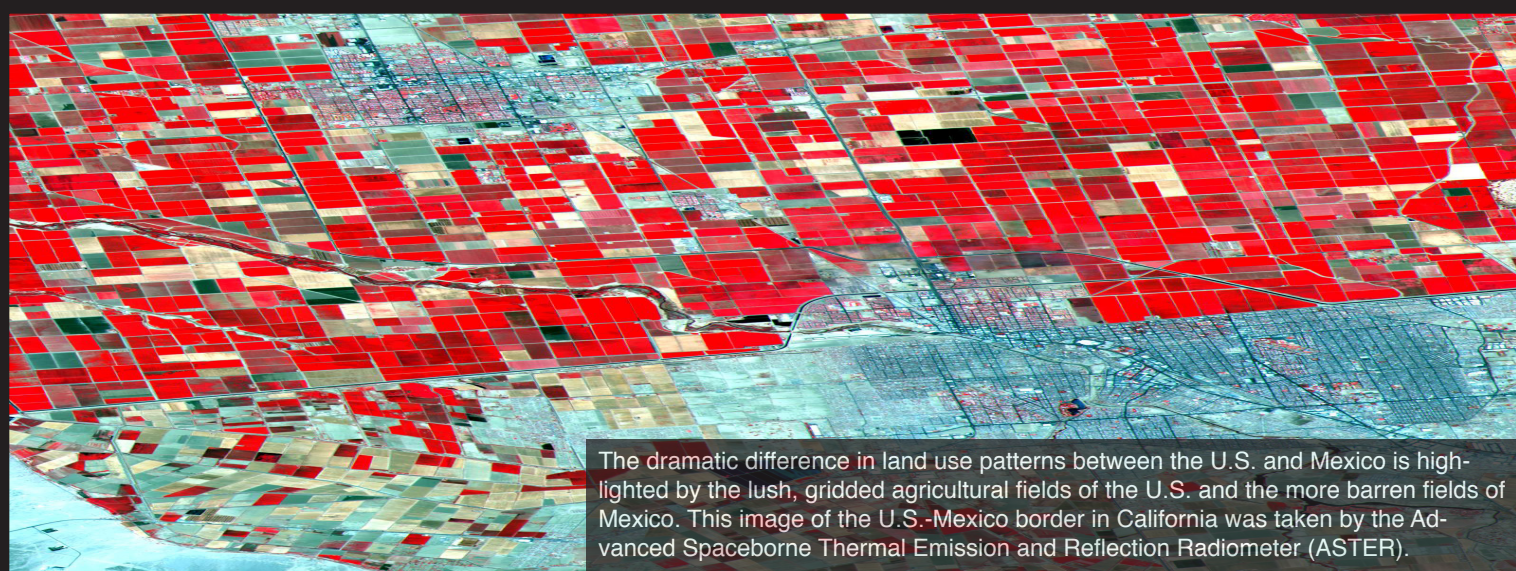


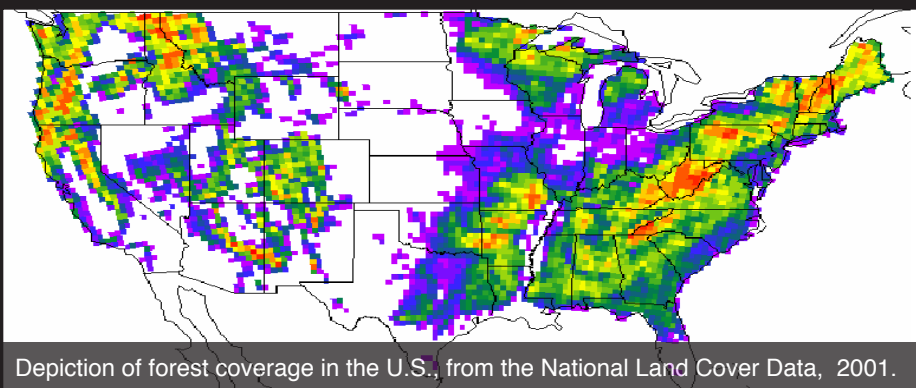
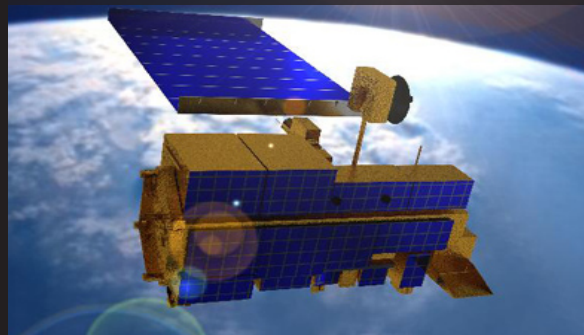


Improved Air Quality Modeling using High-Resolution Remote Sensing Data

Applying High-Resolution Land Use Data Sets to Improve Air Quality Forecasts



NASA's Terra satellite flying the ASTER instrument.



Project Goals

Implement land use and land surface emissivity data provided by NASA satellites in an air quality modeling decision support system

Utilizing MODIS cloud cover and LST to improve model validation procedures

Examining model sensitivity and performance with national land cover data compared with traditional USGS land use data

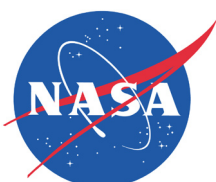
Using projected urban land use to examine impacts of urbanization on future air quality

Project Outcomes

Creation of an improved air quality modeling system for use by a wide variety of government organizations

The ability to evaluate the importance of high-resolution land use and surface properties for air quality forecasting

Creation and implementation of a more versatile model evaluation tool



Improved Air Quality Modeling using High-Resolution Remote Sensing Data

Applying high-resolution land use data sets to improve air quality forecasts

Summary

The goal of this project is demonstrate the feasibility of and to broaden the use of remotely-sensed observations (from MODIS, GOES and other instruments) as an input to an Air Quality Modeling Decision Support System (AQMDSS). This data will also provide for more robust performance evaluation of models presently employed for air quality forecasting, thereby enabling organizations, including the Environmental Protection Agency (EPA), to make more accurate air quality forecasts and protect public health. To this end, NASA and its partners are implementing a new, high-resolution land use data set (National Land Cover Data, NLCD) as well as surface emissivity information and leaf area index (LAI) figures from Moderate Resolution Imaging Spectroradiometer (MODIS). These data sets represent improved spatial and temporal coverage and more accurate physical state of the land surface relative to the existing AQMDSS configuration.

Land use type and the associated surface characteristics (e.g., surface roughness, soil moisture) exert a significant influence on the surface energy budget and near-surface meteorology and the direct impact on air quality simulations can be substantial. Most atmospheric models have traditionally employed the standard land use data sets, created by the U.S. Geological Survey. These data sets do not take into account the changes in land use or surface characteristics over time and can therefore produce inaccuracies in air quality models.

NASA and its partners are enhancing the Atmospheric Model Evaluation Tool (AMET), which is used by the EPA for evaluating performance of atmospheric models.

Through these enhancements, the observation to model matching module of AMET will be extended to enable performance statistics based on satellite observations. This greatly improves the ability of AMET to perform model evaluations over areas with sparse ground observations.

Project Details

NASA and its partners will conduct modeling simulations using USGS and NLCD in order to compare which data set creates more accurate forecasts. This testing will be done in three major geographic areas: Phoenix, Baltimore-Washington and Houston. This comparison allows for examination of the impacts that land use characterization has on both meteorology and air quality.

AMET will be modified to enable use of MODIS cloud cover and land surface temperature for model evaluation. This project will also enhance the ability to predict changes in land use due to urbanization and quantify impacts on meteorology and air quality.

The ability to apply satellite observations to air quality issues derives from decades of investments by NASA and the atmospheric research community in retrieval methods, sensor technology, validation efforts, and other scientific research. The model sensitivity studies by D. Byun and colleagues, described in Byun et al. (2004) specifically laid the foundation for this project by providing a detailed examination of the role of land use and land cover on the urban heat island and how changes in the urban fabric affect air quality.

NASA APPLIED SCIENCES PROGRAM & AIR QUALITY

The NASA Applied Sciences Program supports innovative approaches to integrate Earth science research results (e.g., satellite observations and models) in decision-making tools that organizations use to benefit the nation and society.

The air quality applications program supports activities to apply Earth science research results to air quality management, policy, and decision making.

The air quality program focuses its activities according to four themes: air quality planning, forecasting, emissions inventories, and compliance.

For more information about this project:

Maudood Khan
Marshall Space Flight Center
256-961-7048
Maudood.khan@nsstc.uah.edu

For more information regarding the NASA Applied Sciences program, contact:

Lawrence Friedl at
202-358-1599
<http://science.hq.nasa.gov/earth-sun/applications/index.html>

Key Web sites

Marshall Space Flight Center Earth Science Applications

http://weather.msfc.nasa.gov/applied_science/

EPA Office of Air Quality Planning and Standards

<http://www.epa.gov/air/oaqps/index.html>

EPA Photochemical Models

<http://www.epa.gov/scram001/photochemicalindex.htm>